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(seen tergally) spatulate process, while that of *Nudaurelia* is scarcely longer than broad, and has no such prolongation, only a little knob; the claspers are longer, while the penis is very large and wide, ending in a wide lobe (seen tergally) and extends nearly to the end of the claspers.

The markings are in general similar to those of *Nudaurelia cytherea*, but the discal spot of the fore wings is much smaller, and less complete, the clear space minute; on the hind wings the discal spot forms a large red ocellus, the center piled with black scales.

Should the generic name here given have been preoccupied, it may be changed to *Euaurivillius*.

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## A REVISION OF THE NORTH AMERICAN SPECIES OF THE GENUS CHOREUTIS.

BY W. D. KEARFOTT.

These exquisite little creatures with their wealth of silver and metallic scales have always been of more than ordinary interest to me, and when I had the good fortune to breed a long series last summer, the subsequent efforts to identify them aroused an additional interest in the literature on the subject, of which this paper is the result.

I took a number of my bred specimens to the National Museum and compared them with all of the North American and European species there but could find none that were the same as mine. I then forwarded a pair to Lord Walsingham and another pair to Mr. E. J. Meyrick. Their replies, which I quote below, indicated that my species might be new and also raised the question whether the true *bjerkandrella* Thunb., and its var. *pretiosana* Dup., which have so long been on our lists, really do occur in the United States.

The investigation of the latter question was considerably more than I had bargained for, and for a novice seemed like presumption so soon after the revision of this group by Dr. Dyar and Professor Fernald, in the Canadian Entomologist.

I was fortunately, however, in possession of a goodly number of specimens from widely separated parts of North America, and as a primary requisite I obtained from Drs. Staudinger and Bang-Hass long series of the European *bjerkandrella* and *pretiosana*, as well as all other available European species of this genus. I was rather alarmed to find that, while closely allied, none of the European forms compared

exactly with any I had from this country. I then borrowed from Dr. Dietz all of his specimens and again visited the National Museum and examined carefully all the specimens there (both North American and European). In the meantime Lord Walsingham kindly sent me a pair of *silphiella*, which he collected thirty years ago in California and Mr. Meyrick a specimen from New Zealand. Miss Murtfeldt also loaned me one of her Missouri bred specimens. Altogether I have had the opportunity for critical comparison of between 250 and 300 specimens.

Almost from the beginning I was convinced that we had a larger number of valid species than was indicated by the late synopses and this conviction was strengthened by the examination of each fresh lot of material, and what was most convincing was that the specimens could readily and easily be separated out into the specific groups I had arranged for them and moreover the species did not intergrade and I have seen no specimens that could doubtfully be referred to two or more species.

The only stumbling block was the separation of *pretiosana* from the nearest allied American form, as it certainly was but little less than sacrilege to attempt to root up and cast away so venerable a trespasser from our lists; in point of fact I have not a particle of doubt that in the, possibly not very remote, past *pretiosana* was common to North America, Eurasia, Australasia and possibly South America (I have an unidentified species allied to it from Brazil) but time and environment produce changes and I believe when a change becomes a fixture and invariable new species are evolved. In fact our science is based on evolution; we generally agree with Darwin that man's ancestor was monkey and while we can also agree that both have many characteristics in common it would be difficult to find one with the temerity to claim they were the same species or even that one is a variety of the other; and so, I have taken the stand that our American forms have all so far departed from the stem forms that we have separate and distinct species.

I have recognized twelve species and one variety and it is a nice question for the splitters and lumpers to decide whether there are ten varieties of *pretiosana* or whether they are all *pretiosana* or whether they are all good species. My conclusions point to the last, for the simple reason there is no trouble to separate out the species. Fortunately, in only one instance, was there a single specimen to repre-

sent a species, that, however, *extrinsicella*, is so distinct from all others that it could not be an intergrade; of one other there were two specimens, of the balance from three to thirty odd. The largest number were of my bred specimens, *carduiella*, and of all of this number thirty-eight specimens, the marks, colors, shape, and size are constant in each, excepting, of course, the ♂ is slightly smaller than the ♀.

Unfortunately we have but little knowledge of the larval habits and life-histories of our American species. When these are all worked out we shall have better evidence to go by than classification based principally on coloration. Miss Murtfeldt has recorded the finding of the larvæ in communities on *Gnaphalium polycephalum* webbing the leaves and when nearly mature spinning quantities of somewhat viscid silk. In the National Museum are quite a number of specimens bred by Chittenden in the vicinity of Chicago on the same plant and with the same habit. Miss Murtfeldt's bred specimen is identical with the Chicago specimens, as are also flown specimens taken by Dr. Dietz at Hazleton, Pa., and all are very distinct from any other North American species. This species I have named *gnaphaliella*.

The larvæ of *silphiella* were found by Mr. Coquillett in Illinois on *Silphium integrifolium* in nests formed by fastening the terminal leaves together by a few threads.

I found the larvæ of *carduiella* feeding on the pith inside the main stalks of *Carduus spinosissimus* at Anglesia, N. J.

It will be observed that the habits of the only three larvæ known are quite different, the first spinning considerable silk and webbing the leaves, the second fastening leaves together with silken threads and the third, borers in the stalk. These differences in larval habits, not to mention the different food plants, would seem to indicate different species, especially as in the case of the first named, bred by two people, in different localities, but with exactly the same habits and producing exactly the same moths. The earlier descriptions of the larvæ are brief but they also seem to indicate differences.

As our early entomological literature is so widely scattered and frequently almost unavailable to the majority of working entomologists from having been published in foreign magazines or early American journals that have long been out of print, I have taken the liberty of repeating the original descriptions and the few references to the American species of the genus, so as to bring together in one paper

all of the information on the subject that I have been able to locate, hoping it will be of assistance to others who may become interested in this group.

After each description I have also stated the chief claims for specific difference, usually in a comparative way to quickly assist in the identification. I have found one reference to American species of this genus by Zeller in Verh. Zool. Bot. Gesell. Wien, XXV, 320, 1875, of which the following is a literal translation:

"*Choreutis pretiosana* DUPONCHEL, Suppl. IV, 182, pl. 65, f. 9.

"*Choreutis vibrana* var. *australis* ZELLER, Isis, 1847, p. 643.

"This species, which is found in the vicinity of the Mediterranean Sea, is separated from *bjerkandrella* Thunb. (*vibrana* Hubn.), only by its smaller size and lighter color, the markings are identical but the fore wings of *bjerkandrella* have not always a less convex hind margin. Besides *pretiosana* differs somewhat in size and the ♀ is somewhat smaller than the ♂.

"The seven North American examples before me are still smaller than the ♀ of the European *pretiosana*. In the four from Texas, the two curved bands composed of raised scales (the first rather straight before the middle, the second bent and enlarged by two-thirds above the middle) are light gray, in the three from Ohio, which Schläger determined as *australis*, are pure white, so that the scales, under an ordinary lens, on the outer band are only indistinctly visible. (If these white bands are constant, these specimens may be separated as var. *ohioensis*.) I have taken in Syracuse (Asia-Minor?) a similar ♀ less distinctly white, but agreeing otherwise.

"That the specific identity between the American and European examples is certain, and as an importation is not to be thought of *pretiosana* can be added to the species originally common to both continents."

I feel quite sure had Zeller the opportunity for studying large series of specimens from all parts of North America, he would have modified the views as expressed above, in fact Lord Walsingham, who has, I believe, the identical Texas and Ohio examples referred to by Zeller has compared them with specimens of *carduiella* and pronounces them distinct and even expresses a doubt that the European forms occur in this country at all, as will be noted in copy of his letter under the caption of *carduiella*.

Lord Walsingham, in Trans. Am. Ent. Soc., 1882, Vol. X, p. 167, refers to *bjerkandrella* and says:

"This species has not, so far as I am aware, been recorded from North America. I have received it from Miss Murtfeldt, from whom the specimens in Professor Fernald's collection were also obtained. It occurs also in California, together with a form identical with, or very closely allied to, *Choreutis silphiella* Grote (Papilio, Vol. I, p. 40), which must probably be regarded as distinct."

## SYNOPSIS OF SPECIES.

Fore wings pointed at apex.

With metallic scales on hind wings.

A few green metallic scales on fore wings.....**inflatella**.

Metallic scales lilaceous only.....var. **virginiella**.

Without metallic scales on hind wings.....**dyarella**.

Fore wings rounded at apex.

Fore wings ochreous at base.

Hind wings heavily white-banded.....**silphiella**.

Hind wings with short white dash.....**gnaphaliella**.

Hind wings with no white dash.....**carduiella**.

Fore wings brown at base, or slightly ochreous.

Fore wings with two prominent white bands.....**onustana**.

Fore wings with the bands not white.

Basal brown space without or with but a faint lilaceous band.

Outer edge of cloud defined by a curved line.....**sororculella**.

Outer edge of cloud indefinite; wings elongate.....**coloradella**.

Basal space crossed by a whitish band.

This band curved.

Outer half of brown basal area not clouded with whitish

scales.....**occidentella**.

Outer half of brown basal area clouded with whitish

scales.....**buskiella**.

This band straight.....**extrinsicella**.

Fore wings white at base.....**leucobasis**.

**Choreutis inflatella Clem.**

1863. *Brenthia inflatella* CLEMENS, Proc. Ent. Soc. Phil., Vol. II, p. 5.

1872. *Brenthia inflatella* STANTON, Tineina No. Am., p. 209.

1900. *Choreutis inflatella* DYAR, Can. Ent., Vol. XXXII, p. 85.

1900. *Choreutis inflatella* FERNALD, Can. Ent., XXXII, p. 242.

## Original description :

"Fore wings dull orange; in the middle of the wing dark fuscous, dusted with white. At the base of the wings are three or four small spots of a beautiful metallic green, and two others of the same hue, on the disk, between which, on the costa, is a small white spot. At the apical third of the wing is a curved metallic green band, extending from the costa to the inner angle, beginning on the costa in a small white spot. A little beyond the metallic line, towards the base of the wing, on the inner margin, is a small spot of the same metallic hue. Near the hinder margin is a sub-terminal dark fuscous line, which from the costa to the middle of the wing is overlaid with metallic green scales, and on the costa between the two transverse lines, is a white spot. Cilia fuscous, white in the middle of the wing. Hind wings dull fuscous, with two iridescent spots near the inner angle. Abdomen with two iridescent spots near the tip.

"Antennæ fuscous, annulated with white. Head and labial palpi gray varied with fuscous. Feet dark fuscous annulated with white. I have before me a single specimen taken on the wing in July."

Var. *virginiella* Clem.

1864. *Brenthia virginiella* CLEMENS, Proc. Ent. Soc. Phil., Vol. III, p. 505.

1872. *Brenthia virginiella* STANTON, Tineina No. Am., p. 257.

1900. *Choreutis virginiella* DYAR, Can. Ent., Vol. XXXII, 85.

1900. *Choreutis virginiella* FERNALD, Can. Ent., XXXII, 243.

## Original description:

"Fore wings dark brown, tinged with ochreous between the markings towards the tip, with an oblique, somewhat violet-hued silvery line, from the costa at the apical third, directed towards the anal angle; a line of the same hue from the tip of the wing, parallel to the hinder margin, and a white costal streak equidistant from the two silvery lines. On the inner margin, a little interior to the anal angle, is a silvery, somewhat violet hued spot. Cilia whitish beneath the tip of the wing, with a dark intercilia line. Hind wings dark brownish, with a silvery spot near the hinder margin above the anal angle. A single specimen. Virginia. Coll. Ent. Soc. Phila."

It is unfortunate that Dr. Clemens could not have reversed the order of publication of the above descriptions, so that the form with lilaceous scales only (*virginiella*) could be the species, and that with a few scattered greenish metallic scales (*inflatella*) the variety, as the former is the most common form. I have before me seven specimens of *virginiella*, five taken in the vicinity of Montclair, N. J., and two from collection of Dr. Dietz, labelled Toronto, Can., and have examined at the National Museum one specimen from Boston, Mass. (coll. Beutenmüller). There is also in the National Museum one specimen of *inflatella* (locality unknown).

The only difference that I can discover and in fact the only difference in Dr. Clemens' descriptions, although they are differently worded, of *virginiella* and *inflatella* is that the latter has a few greenish metallic scales on the inner and costal half of fore wings, while on *virginiella* all the scales are lilaceous. The outer marginal band of metallic scales on *inflatella* as well as other scales on outer half of fore wing are of this same color. So the only difference is that while in *virginiella* all the metallic scales are lilaceous, in *inflatella* some are lilaceous and some have a greenish reflection. I do not consider this a specific difference, but it may be known by its varietal name at least until the life history is known. It is probably the most distinct and least variable of any of the species of this genus, its nearest prototypes being *C. myllerana* F. of Europe and the larger Pacific Coast form *dyarella*.

The chief distinguishing characters are:

1. Shape of primaries unlike any *Choreutis*, except *dyarella*; apex terminates in a sharp point and outer margin nearly straight; in these

respects it more nearly resembles the genus *Simæthis*, where it may finally land.

2. A triangular ochreous area extending from tip along one-third of costa, thence to hind angle; this is divided by a paler ochreous wedge-shaped streak, widest at costa and pointed at hind angle.

3. On the costa, enclosed by the pale ochreous streak is a white spot, or triangular dash, base line along costa, lower apex pointing towards hind angle. There are two additional minute white costal spots, at equal distance apart, between this larger spot and base.

4. In fresh specimens the inner half of primaries are very thickly powdered with cream color scales.

### **Choreutis dyarella**, sp. nov.

Dark brown, mixed with whitish scales. Fore wings shaded with bronzy red, most distinct on apical half; a few metallic scales towards base. A straight white shade from costa to inner margin at basal third, forming a distinct spot on costal edge. A similar narrow line at outer third forming a dot on the costa, two at end of cell and one on internal margin. A strongly curved line of metallic scale joins the costal and marginal dots, is twice broken and touches outwardly the third transverse white band, which reaches from costa before apex to anal angle and is nearly continuous, and is broken only at upper third where the metallic scale band touches it. The submarginal streak of metallic scales not reaching the apex. Fringe white, black at apex and anal angle with a brown spot in the middle.

Hind wings blackish, the usual submarginal dash yellowish-white, distinct. Fringe black with basal yellowish-white line; outer half white except at apex and anal angle.

Wings below smoky brown. Two obscure white dots on costa and a few scales outwardly on fore wings. Hind wings with outer irregular white curved line with a lunate white discal streak. Tarsi strongly banded with white. Femori blackish, with a median whitish band. Expanse, 12 mm.

Described from three specimens from Dunsmuir, Cal. (Wickham).

National Museum type No. 6263, one co-type in my collection.

I take pleasure in naming this species after Dr. Dyar.

This is a slightly larger species than *inflatella*, but it belongs to the same group, with acutely pointed fore wings.

It can be distinguished from *inflatella* by: (1) Larger size, (2) no metallic scales on hind wings, and (3) white submarginal band on under side of hind wings, in *inflatella* this band is reduced to a fine almost obsolete line.

### **Choreutis onustana** Walk.

1864. *Simæthis onustana* WALKER, Cat. Lep. Het., Pt. XXX, 996.

1875. *Choreutis ohioensis* ZELLER, Verh. Zool. Bot. Ges. Wien, Vol. XXV, 320.

1900. *Choreutis onustana* DYAR, Can. Ent., Vol. XXXII, 85.

1900. *Choreutis onustana* FERNALD, Can. Ent., Vol. XXXII, 242.



### Original description :

"Male. Ferruginous. Palpi acute, not longer than the breadth of the head, with a long dense fringe beneath; third joint lanceolate, much shorter than the second. Antennæ setose. Fore wings rounded at the tips, with two irregular, whitish slightly curved bands, and with several glittering chalybeous black-bordered dots; first band before the middle, more oblique than the second, which is beyond the middle; a chalybeous streak along the basal part of the costa; fringe bordered by two cinereous lines. Length of body 2 lines; of the wings 6 lines."

"Nova Scotia. From Lieut. Redman's collection."

The general appearance, shape and size of this species is not unlike European *pretiosana*; it differs from it in having two wide irregular pure white bands extending from costa to hind margin on the fore wing. Zeller received three specimens of this species from Ohio and suggested the name of *ohioensis*, if it should prove to be different from *bjerkandrella*, but Walker's description was made in 1864 and Zeller's name must go in the synonymy.

Walker gives locality Nova Scotia; Professor Fernald adds Amherst, Mass.; Dr. Dietz has specimens labelled Central New York, June 1, 1887. In the National Museum are specimens from New Hampshire and Ontario (Hanham), so it seems to be a northeastern species with Ohio as the south and western limit. It can be distinguished readily by the two broad, irregular, white bands, extending from costa to hind margin. The inner band is at inner third and outer band beyond outer third.

### **Choreutis gnaphaliella**, sp. nov.

Light brown or fuscous. A broad inner band and a narrow band near margin, thickly sprinkled with whitish scales. Three large black spots.

Antennæ dark brown, ringed with white. Head, palpi fuscous, latter white at base; outer ends of scales on head paler. Thorax yellow, ochreous, a median line of whitish scales, patagia edged with ochreous.

Fore wings: Basal area ochreous, divided on median line by line of metallic scales, also a fine line of same on costa and a few metallic scales close to hind margin on outer edge of ochreous patch. A broad, oblique, slightly curved band of light brown heavily dusted with whitish scales, from costa to hind margin, outer edge irregular; a few scattered metallic scales on this band near costa and near hind margin. A large oval, black velvety spot in center of outer half, a smaller black spot on hind margin below and inwardly to large spot, a rectangular black spot on outer margin beyond large spot; all of these spots separated from each other by ground color; a few black scales follow apical line. Between central black spot and costa is a rectangular area of brown and ochreous scales, becoming almost black at outer edge; just beyond this, before apex, is a small patch of almost white. Scales forming a white costal spot. In every place where there are black spots or scales, they are overlaid with metallic scales. Outer marginal band brown, sprinkled with white scales; this band extends out on the fringe; the latter is fuscous.

Hind wings: Light fuscous, veins darker. A whitish subterminal dash. Fringe fuscous, shadowed by two pale marginal lines, outer edge paler.

Under side fore wing: Pale fuscous; white marginal line from costa to hind angle, paralleled by an inner whitish line. A white spot on costa at inner third, another on hind margin at inner third. Under side hind wing: Pale fuscous, a paler marginal line becoming white and broader at apex, nearly paralleled by a broader white band, inside of this is a white dash. Abdomen brown, a band of whitish scales at posterior edge of each segment. Legs so thickly covered with white scales that ground color is almost hidden; except tarsi, pale golden beneath and an alternate brown and white ring on each joint above. Expanse, 7.5 to 8.5 mm.

Described from eight specimens. St. Louis, Mo. (Miss Murtfeldt) Hazleton, Pa. (Dr. Dietz), Chicago, Ills. (Chittenden.)

Type, U. S. Nat. Mus., No. 6264; co-type, Collections, Murtfeldt, Dietz, Kearfott.

The following description of larva and habits by Miss Murtfeldt is quoted from Professor Fernald's paper, Can. Ent., XXXII, p. 241:

"The larva is found late in June (in Missouri), and again in October, mining and webbing the leaves of *Gnaphalium polycephalum*. When small it works chiefly between the cuticles of the leaves, but later feeds externally, spinning quantities of somewhat viscid web, among which the black powdery frass is profusely scattered.

"The mature larva is 6 mm. in length by 1.5 in diameter across middle segments, from which it tapers very slightly in both directions; form cylindrical, submoniliform. Color translucent, whitish green, immaculate. Head oblique, same color as body, but horny and polished. Collar inconspicuous. Legs concolorous with general surface. Before the first transformation it becomes gregarious, the larvae spinning their dense white sticky cocoons, something to the number of a dozen in close proximity in the general web.

"Pupa pale golden brown, 4 mm. in length, and rather stout, with no especially marked characters. Imagines in seven or eight days after pupation.

"In central Missouri the species is rather rare, and, within the limits of my observation, has only occurred three times within the last dozen years, although careful watch for it has been maintained upon its food plant. So far it has not been found upon any *Gnaphalium* or *Antennaria*, except *G. polycephalum*. I have never taken this species at light."

### **Choreutis silphiella Grote.**

1881. *Choreutis silphiella* GROTE, Papilio, Vol. I, p. 40.

1882. *Choreutis silphiella* WALSINGHAM, Trans. Am. Ent. Soc., X, 167.

1886. *Chalcœa gemmalis* HULST, Trans. Am. Ent. Soc., XIII, 148.

1890. *Choreutis silphiella* DYAR, Can. Ent., Vol. XXXII, p. 85.

1890. *Choreutis silphiella* FERNALD, Can. Ent., Vol. XXXII, p. 241.

#### **Original description:**

"Thorax orange, with a metallic stripe on the tegulæ. Head olivaceous. Pectus and basal joint of palpi whitish. Fore wings with the base orange, to a dusky, inwardly oblique, transverse shade line. A longitudinal metallic stripe before the

shade line below costa and some metallic scales below median vein. Middle of the wing mottled, grayish, enclosing two metallic discal spots edged with black, superposed; below them two faint blackish lines to internal margin. Apical portion of the wing taken up with a wide circle of dusky and orange scales enclosing a series of metallic points edged with black. The space enclosed by the circle, near the margin, is gray and mottled like the middle of the wing. The metallic spots have a violet or green reflection. The circle is twice cut by oblique orange stripes, over the subcostal nervules and over the median nervules, in opposing positions. Edge of the wing dusky, fringes dark. Costal edge with two white dots beneath, wide apart. Hind wing blackish; beneath crossed by a white sub-terminal band, and another before the middle of the wing. Length of fore wing 5 to 6 mm.

*Hab.* Illinois.

The larva of this species is described by Mr. Coquillett as follows:

"Body thickest at the middle, tapering towards each end, pale green; a dark colored dorsal line; piliferous spots and cervical shield green; head small, nearly horizontal, pale green, with a black dot on each side near the jaws, and usually with a black dash on each side near the junction of the head with the first segment; venter pale green, unmarked; 16 legs; length, 13 mm. Lives in communities on *Silphium integrifolium* in nests formed by fastening the terminal leaves together with silken threads. Found June 19; imagoes July 2."

Mr. Grote prefaces the above with the following: "Mr. Coquillett has communicated to me specimens of a *Choreutis* which he has reared, together with a description of the larva. The species appears to be new and is considered by Professor Fernald to be distinct from *pretiosana*." Mr. Grote concludes his description with the statement: "a distinct but allied species of *Choreutis* has been collected by Mr. Hy. Edwards in California (Sierra Nevada)."

The following is Dr. Hulst's description of *Chalcæla gemmalis*, which is manifestly the same as Mr. Grote's species. I have not been able to find Dr. Hulst's types.\*

"Expands 15 mm. Head brown, palpi brown, fringe in front; thorax and basal portion of fore wings rich golden brown; fore wings beyond light ochre, with fuscous shadings; margin yellowish brown, fringe black; near middle of wing, also just within indicated extramedian line, and also on subterminal space at middle, is a velvety black spot, the three being in a row; a fine black line runs from costa to middle spot; there is also midway along costa a faint subcostal black spot; each of all these spots surrounds a few bright golden metallic scales; there is also a line of metallic gold basally along costa; hind wings nearly even, fuscous; beneath, fuscous with a golden tinge, a white spot on costa at beginning of outer line, which is indistinct; an outer cinereous line on hind wings; all margins with whitish lines; fringes fuscous.

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\* Hulst's type of *C. gemmalis* is in the Hy. Edwards collection, American Museum of Natural History, and it is identical with a specimen labeled *C. silphiella* Gr.—W. Beutenmüller.

"Two ♂♂, Sierra Nevada Mountains, Cal. The second specimen has the golden brown of thorax and fore wings replaced with fuscous."

In a general way this resembles the European *bjerkandrella* Thunb., but I have no hesitation in pronouncing it distinct, and moreover from the material I have had an opportunity to examine it is not especially variable. Compared with *bjerkandrella*, the primaries are quite different in outline, in *bjerkandrella* they are rather short and rounded, while in *silphiella* they are elongated and the outer margin instead of being an easy curve is nearly straight. The ochreous base extends farther along the costa than in *bjerkandrella* and its area is greater. The general color of *silphiella* is lighter. The white lines and dashes on the hind wings are much broader in *silphiella*; this is especially apparent on the under surface. The fringe on the hind wings is longer in *silphiella*.

This species has a wide range. Coquillett, who bred the specimens from which Grote described it, took the larvæ in Illinois, Lord Walsingham collected specimens which are labelled "Head of Noyo R., Mendocino Co., Cal., June 8 to 11, 1871." I have specimens from Yellowstone Park, Wyo. (Burrison), and Chicago (J. H. Reading).

In all of the specimens the marks and characters are constant with very slight variation, certainly not enough to warrant a connecting link between it and any other species recognized in this paper.

Its distinguishing characters are: (1) Large size, expanding 15 mm.; (2) ochreous patch at base of primaries, involving one-quarter of length of wing, head and thorax of same color; (3) outer three-quarters of primaries thickly sprinkled with cream color scales; (4) two large velvety black spots on outer half, ornamented with metallic scales, and (5) broad white dashes and lines on inferiors.

### **Choreutis carduiella**, sp. nov.

Dark brown, thickly dusted with cinereous scales, without a lens the ground very dark, almost black, slate color.

Antennæ dark brown, ringed with whitish, tuft at tip of basal joint. Palpi brown, streaked with orange on second joint, basal joint almost white.

Head brown, dusted with white specks. Thorax orange-ochreous streaked with cinereous; outer edge of patagia and two streaks on mesothorax cinereous. A row of greenish metallic scales on inner edge of patagia.

Fore wings: Deep fold at base of median vein, above this at base is a tuft or streak of long raised orange ochreous scales, below it is a smaller patch of shorter scales, same color in ♀ but dark umber in ♂; between these ochreous streaks on median vein, also on costa next to base, is a fine line of metallic scales, also a few metallic scales below ochreous patch near inner angle. Next, outwardly, is a broad

band of ground color from costa to hind margin, thickly sprinkled with cinereous scales, this band is divided on its lower half by a darker line free from lighter scales; on the outer edge of this patch is a line of metallic scales extending half way across wing from costa. Adjoining this outwardly on costa, is a broad patch of long raised orange-ochreous scales, lower edge covering end of cell. On the outer edge of this patch is a line of metallic scales separating it from a short dark oblique line.

Below orange patch is a large velvety-black spot, extending to outer margin, but not to hind margin, this black patch is cut near its outer truncate end by a line of orange-ochreous scales. Many metallic scales are sprinkled over the black. Just below orange patch, in center of wing on hind margin, is a small black spot, beyond this is a smaller black spot. The long raised scales forming the large orange patch above end of cell, become darker and almost black in the lower central part, where it adjoins the black patch just below, these dark raised scales are heavily sprinkled with metallic. The lower, outer edge of black patch, which closely follows line of hind angle is defined by a narrow row of metallic scales. The outer margin below apex is of ground color heavily overlaid with lighter scales, except at the apex, which is almost free from these scales. Along costa just before apex is a short line of darker ochreous, inside of this is a fine line of metallic scales, slightly curved downward at outer end, bordering this on the inner side is another irregular band of ground color free from lighter scales, inwardly is a broader band of ground color, heavily overlaid with whitish scales, extending from costa to center of outer margin where it is absorbed in the marginal band. Fringe fuscous.

Hind wings fuscous, no white dash, but a very few scattered whitish scales forming a thin line along margin at and before apex. Fringe lighter fuscous.

Under side fore wings; dark shining fuscous, a white oblique dash at outer third; this white dash is obsolete in some specimens; a line of white scales along margin and another line of white on fringe paralleling marginal line, a few whitish scales inside of hind angle.

Under side hind wings; same color as fore wing, a short apical curved white line, a long curved submarginal white line, interrupted at upper third and a white dash in center of wing; a small white dot on costa about middle of wing. The white lines and marks on under surface have a bluish reflection.

Abdomen: dark brown, almost black, broad band white scales at posterior end of each segment, anal tuft blackish. Legs blackish, thickly sprinkled with white scales; tarsus golden on under side, white ring on each joint on upper side. Expanse, ♂ 10 mm., ♀ 12 to 13 mm.

Described from thirty-eight specimens bred from *Carduus spinosissimus* Walt. Taken at Anglesea, N. J., June 21-23, 1901. Issued July 2-10.

Types: ♂ and ♀. U. S. Nat. Mus., No. 6265.

Co-types: Collections Walsingham, Meyrick, Dietz, Kearfott, Murtfeldt, and Am. Mus. Nat. Hist.

*Larva.* Last Stage: 12 mm. long, cylindrical, head and second segment slightly tapering, anal end rather blunt. Color pale yellow.

Head: Width .95 mm.; length 1.05 mm.; color pale chestnut, strongly bilobed,

lobes full and rounded; clypeus narrow at base, evenly triangular, high but not reaching to second joint, suture between lobes deeply indented; ocelli on black field; epistoma lighter chestnut of yellowish, labrum and maxillæ brown; antennæ short; spinneret large, with a long spine or thick hair. On back edge of each lobe, partly hidden by segment 2, is a triangular black spot and short black line following joint dorsad. Setæ on head long,  $\frac{1}{2}$  to  $\frac{2}{3}$  thickness of head.

Thoracic feet pale chestnut, basal joint of each whitish and defined by narrow chitinous oval band, this band not complete, but absent on outer or lateral edge. Shield on second segment same color as head, divided by paler dorsal line, moderate, front edge straight, hind edge rounded, bears six setæ each side in usual position, a large brown tubercle before and on a line with spiracle bears two setæ; another large tubercle bearing two setæ below spiracle. Segment three (mesothorax) tubercles, ia + ib, iia + iib, iii separate, iv + v; the first two and last in a vertical row, iii between and caudad to iia + iib and iv + v; vi on center of segment just above foot. The tubercles or tubercular plates are largest and darkest on prothoracic segment, slightly less on next and paler on metathorax, and all are darker than the abdominal plates.

Abdominal segments i dorsad and cephalad to ii, iii dorsad and close to spiracle, iv and v united caudad and cephalad to spiracle vi above base of proleg and just below it on base of proleg is another small tubercle bearing a single seta (vi-a?).

Anal shield not chitinous. Abdominal tubercular plates are moderately large, pale brownish-yellow. Setæ are pale, rather long, about half body diameter. Crochets on abdominal feet in closed circles, hooks brown. Tubercles on head look like tiny globules of clear glass resting on the flatter surface, the tubercles on the body tubercular plates are also tiny globules or points, from which the setæ arise. Spiracles slightly elliptical and ringed with brown.

Skin slightly granulated and covered with very minute hairs.

*Cocoon*: Boat or hammock-shaped, pointed at each end, 15 to 20 mm. long, 3 to 4 mm. wide, of soft fine pure white silk of the same appearance and texture as the egg-nests of some spiders.

*Pupa*: Bright chestnut, darker on dorsum, very smooth and rounded; on each abdominal segment dorsal surface is a finely fluted ridge, very minute hooks on anal segment; all abdominal segments free, no organs free but after dehiscence antennæ cases are free. 6 mm. long, 1.5 mm. thick.

*Habits*: Feeds on pith in main stalks of *Carduus spinosissimus*, from two or three to a dozen or more may be found in each stalk, they excavate a gallery nearly its whole length, common to all; gallery not lined with silk, at convenient intervals and usually just above a new joint or above where stalk branches forth are small holes, through which the frass is ejected outside of the stalk. In fact an easy way to ascertain if the stalks contain larvæ is to examine them for considerable masses of frass resting in the angle between the main stem and branches.

All the larvæ that I observed were within the stalks, but there is

evidence that they come outside, as the under side of the leaves was covered with a slight web of silk. This may be the foundation for cocoons which are spun under the leaves and below the thistle head in any convenient partially protected angle. It is also possible that the larvæ eat the epidermis from the under side of the leaves, as they appear to have been eaten in spots, but not nearly sufficient for the sustenance of the larvæ and my opinion is that their principal food is the pith.

Mr. Meyrick makes the following comparison between *bjerkandrella* and *carduiella*:

"On comparison of your specimens of *Choreutis* with *C. bjerkandrella*, I am decidedly of the opinion that, though very closely allied, they are quite distinct specifically. It would be possible that the exhibition of connecting forms from other parts of America might modify this view, but I do not know of any such. The points of difference on which I should rely are as follows:

1. *C. bjerkandrella* has a silver spot on the middle of the costa of the fore wing, which is wholly absent in your species.
2. In *C. bjerkandrella* the two light fasciæ of fore wing form white spots on costa, in yours they do not.
3. In *C. bjerkandrella* the anterior edge of the second light fascia is entire, whilst in your species it is interrupted from the middle to near dorsum, there being a fulvous streak in its place, which is absent in *bjerkandrella*.
4. The fasciæ of lighter irroration are much broader and more extensive in your species.
5. The silver streak on the anterior margin of the second fascia towards costa is very much more oblique in your species.
6. In *C. bjerkandrella* there is a short white post-median bar in hind wings; in your species this is barely indicated by two dots or two white scales each, which are moreover differently placed and nearer the termen.

These points appear to me to be all quite constant, and fully sufficient.

I enclose a specimen of *C. bjerkandrella* from New Zealand as a type for your use; I am not aware that it differs in any obvious way from South European examples.

Does the true *C. bjerkandrella* occur in America, or do the published records of it refer to your species?

Lord Walsingham's comparison of *bjerkandrella* and *carduiella* is as follows:

"I am very much obliged to you for allowing me to keep the three specimens of *Choreutis* sent for examination. I am not acquainted with any description of either of them.

"At a time when I was not in possession of so large a series of North American representatives of this genus as I now have, I was unable to separate specimens from California or from Missouri from the European *bjerkandrella* Thunb., which has been

joined to *pretiosana* Dup., by Staudinger. Zeller regarded these two European species as distinct at the time when he identified specimens from Texas and Ohio as *pretiosana*, and his specimens, now before me, are certainly nearer to this than to the typical *bjerkandrella*, but I now see differences which may possibly be of special value in all of the American species.

"Your two New York examples are nearer to *pretiosana* Dup. (= *australis* Z.) the South European form, but they differ in having no markings on the under side of the fore wings, and in the presence of a small metallic spot above the dorsum on the inner edge of the first pale sprinkled band near the base. This occurs also in Zeller's and Murtfeldt's specimens, but not in the European forms. I think your two New York examples are distinct from all with which I am acquainted. Notably, in the absence of a distinct pale streak on the upper side of the hind wings. As you have compared it with American types you are probably justified in separating it. I send you two specimens of *silphiella* Grote. It seems to me rather a stretch of imagination to lump this with *bjerkandrella*."

### **Choreutis busckiella**, sp. nov.

Dark brown, heavily overlaid with whitish scales, with only a trace of ochreous.

Antennæ brown, ringed with white. Palpi brown, whitish at base. Head and thorax brown, dusted with white, no ochreous scales, a few silvery metallic scales along lower edge of patagia.

Basal area dark brown, a faint streak of ochreous below costa, in some specimens no trace of ochreous, costa at base black, overlaid with metallic scales; a wide dark brown band beginning at costa extends downward half and then at right angles to hind angle. On the lower end of this band is the usual velvety black patch; in this species it is large and almost rectangular, cut near its lower end by a double line of dark brown; between this dark band and basal area as well as the balance of fore wing is of ground color heavily overlaid with whitish.

Metallic scales occur: a line on costa near base, a short line below on median line and a few scales below this near hind margin; on first white band, a line of scales extending from costa nearly to hind margin just beyond first third, this line interrupted twice and curving slightly outward at lower end; three small spots in oblique line from costa on dark brown patch, below this is short horizontal line; a line of scales beginning at costa outer third and following margin around apex and outer margin to hind angle, interrupted once above and once below apex. Fringe brown.

Hind wings grayish-brown, a short curved line of whitish scales about center of outer margin and a few scattered whitish scales at apex. Fringe brown.

Under side fore wings immaculate, fuscous. Under side hind wings fuscous, narrow band whitish, parallel to outer margin, a shorter whitish line within this, and a short dash about center of wing.

Abdomen brown, under side whitish. Under side thorax white. Legs brown, sprinkled with white. Expanse, 12 to 13 mm.

Three specimens, Hastings, Florida. (A. J. Brown), March 15 and 16.

Type, U. S. Nat. Mus., No. 6307; co-type, Collections Dietz and Kearfott.



I am glad to honor this species with the name of my friend, Mr. August Busck, to whom I am under many obligations for assistance and advice, and who will, in a very brief time, be known as our foremost American authority on Tineidæ.

This species differs in the almost total absence of ochreous from the thorax and fore wings, and in the almost uniform color of the latter. The fore wing is divided almost equally into four bands, the basal and second intermediate brown or black and the first intermediate and marginal almost white. Its nearest ally is *carduiella*, and it may, when the life-history is known, prove to be an extreme form of this. It can be distinguished from *carduiella* by: (1) ochreous obsolete or nearly so; (2) much lighter and whiter in color, and (3) whitish curved line on hind wing.

### **Choreutis sororculella Dyar.**

1890. *Choreutis sororculella* DYAR, Can. Ent., Vol. XXXII, p. 86.

1890. *Choreutis sororculella* FERNALD, Can. Ent., Vol. XXXII, p. 242.

#### Original description :

"Generally similar to *bjerkandrella*, Thunb., but without any traces of the yellow dashes at the base of the fore wings. The pale gray space in the middle of the wing is sharply limited without and within by a paler line; in the center of this space is a large group of black and metallic scales; beyond the pale line are no black scales, but a regular, distinct, subterminal metallic line; a subcostal metallic streak in basal space. Hind wings with a white dash as in *onustana*."

"Two examples. Placer Co., California. June (A. Kœbele); U. S. Nat. Mus., type No. 4426."

I consider this a good species. It can be distinguished easily from *silphiella*, *gnaphaliella*, etc., by the narrow whitish band next to outer margin, which curves easily and evenly, slightly inwards to the costa; whereas, in *silphiella*, etc., this band is sharply right-angled at about one-third from the costa besides broadening out into a spot.

The basal area of front wings is uniformly light fuscous, next outwardly is a large patch of whitish; this patch only touches costa at a point next to basal fuscous patch. Inside of white band along outer margin are three velvety black spots, arranged in the form of a slight crescent.

Distinguishing characteristics: (1) General color pale fuscous, no ochreous, (2) marginal white band slightly curved, not angled, (3) velvety black spots arranged in a crescent following line of outer margin. Center spot slightly larger than other two.

**Choreutis extrincicella** Dyar.

1890. *Choreutis extrincicella* DYAR, Can. Ent., Vol. XXXII, p. 86.

1890. *Choreutis extrincicella* FERNALD, Can. Ent., Vol. XXXII, p. 242.

## Original description :

"Light brown, head and palpi whitish. Fore wing with basal half brown, crossed by a broad, straight, white line with a few silvery scales outwardly on costa. Terminal half of the wing nearly white, except narrowly along outer margin, streaked above with longitudinal, somewhat cuneate, lines of black scales, below containing a single elongate, rounded, black patch with two groups of silvery scales; similar scales on outer border of white patch; outer half of fringe white. Hind wings pale brown. Expanse 12 mm."

"One male. Wisconsin. U. S. Nat. Mus., type No. 4427."

The species is more unlike the general *bjerkandrella* type than any of the genus. It is a very beautiful species and Dr. Dyar fortunately, when making his description, had before him an almost faultless specimen. It can be recognized at once by the large amount of white on the fore wings.

The largest patch of white almost entirely covers the outer half, extending from costa to hind margin. Near the anal angle is a velvety black spot, ornamented with metallic scales, this spot encroaches on and appears to be laid on the white. The outer margin is light fuscous. The inner edge of the large white patch is bounded by a broad almost straight fuscous band, next towards the base is a narrower whitish band, the base of wing is fuscous. All of these bands and colors extend from costa to hind margin. Hind wings are immaculate and under side of all wings are free from whitish lines and dashes and very pale in color.

It can be identified by: (1) Very large white patch on outer half of fore wing; (2) a single rectangular velvety black spot on this white area, near hind angle is also a very small black spot > shaped. This is close to margin and just above the large black spot. (3) Hind wings immaculate. (4) Under side of all wings very pale and free from whitish marks.

**Choreutis occidentella** Dyar.

1890. *Choreutis occidentella* DYAR, Can. Ent., Vol. XXXII, p. 86.

1890. *Choreutis occidentella* FERNALD, Can. Ent., Vol. XXXII, p. 242.

## Original description :

"Grayish brown; basal half of wing of this color, with a curved white line across its center. Terminal half of wing filled, except somewhat narrowly along outer margin, by a large whitish patch, irrorate with brown scales, containing above

a small black patch and below a large quadrate one, cut by a whitish line transversely; silvery scales along costa basally, middle of wing, subterminally and in the black patch. Hind wings brown, immaculate. Below a faint, irregular, whitish, submarginal line on hind wings and two costal dots on fore wings. Expanse 14 mm."

"One male. California (Coll. Beutenmüller). U. S. Nat. Mus., type no. 4428."

I consider this a good species; it can readily be separated from *silphiella* by the absence of the ochreous patch at base of front wings, in place of which is a whitish curved band, convex outwardly, just beyond base and extending from costa to hind margin.

The pattern of coloration and metallic scales on the apical half of front wings is not unlike *leucobasis*, inasmuch as in each species there is a large wheel-like or circular mark; in *occidentella* the upper part is defined by two white dashes on the costa, enclosing an area more or less suffused with whitish scales, the lower part is defined by a pair of velvety black spots. Dr. Dyar described the species from one specimen labelled "California." In my collection is one specimen from Yellowstone Park, Wyo., taken by Mr. Burrison late in June or early July, 1900. My specimen differs from type only in that there is less white in the circular mark referred to.

This species can be distinguished by: (1) Head, thorax and basal half of fore wing brown, (2) curved white line from costa to hind margin, close to base and (3) hind wings brown, not marked with white lines or dashes.

### **Choreutis coloradella, sp. nov.**

Head, thorax, fore wings dark brown, sprinkled with lilaceous scales; basal half of fore wings broadly of ground color; crossed in the middle by a faint curved lilaceous whitish band, sometimes obsolete. Outer half washed with lilaceous, except at margin, this area forming a large rounded patch reaching costa and inner margin, obscurely divided in the upper half by blackish veins; containing below an elliptical patch of black slightly raised scales, truncated outwardly, divided by an almost vertical line of whitish or faintly orange-tinted scales, marked with a few metallic scales.

A faint oblique metallic line from costa basal third to this patch below middle. A small curved subapical metallic line. In some specimens ground color becomes almost white in a dash bordering black patch above. Fringe blackish, interlineated with white. Hind wings blackish, fringe interlineated with white. Fore wings dark gray below, slightly washed with whitish towards apex, no definite lines. Hind wings washed with whitish except on veins. Expanse, 13 to 18 mm.

Described from six specimens. Durango, Colo. (Dietz), southwestern Colo. (Dietz), Colorado (Fernald), top Las Vegas range 11,000 feet, New Mexico (Cockerell), Sitka, Alaska (Kincaid, Harriman

Exp.). National Museum. Type No. 6266. Co-types in collections of Dietz and Kearfott.

This species is very distinct from any other of this genus. The wings are unusually elongate and it is the only species I have seen in which the basal ground color so prominently occupies the inner half of fore wings. The other half, excepting the outer margin and apex, is almost uniformly overlaid with lilaceous scales; thus the appearance of the fore wings is of two colors, almost evenly divided, the inner half brown and the outer half whitish. The upper surface of hind wings is blackish-brown, unmarked with whitish lines or dashes, in this latter respect alone it differs entirely from *silphiella*. But there is hardly a doubt the two species could be mistaken for each other, as *silphiella* is of various shades of light browns, yellows and ochreous, whereas *coloradella* is dark brown or blackish and sordid. It is very different in general appearance from *occidentella*, the latter is well marked with clearly defined and prominent white lines and bands which are entirely absent in *coloradella*. Professor Fernald, Can. Ent., XXXII, p. 242, 1900, under heading of *C. occidentella*, states he has "long had this species in his collection, under the name of *coloradella* and has so named it for others." I very much regret he did not publish his description, as I am well convinced the species will stand, and I take pleasure in giving it the name Professor Fernald had selected.

It can be distinguished by: (1) Large blackish brown basal area, (2) absence of ochreous at base or thorax, and (3) blackish-brown hind wings, unmarked.

### **Choreutis leucobasis** Fern.

1900. *Choreutis leucobasis* FERNALD, Can. Ent., Vol. XXXII, p. 242.

#### Original description:

"Expanse of wings 10 to 12 mm. Head, thorax and base of fore wings pure white. Outer two-thirds of fore wings dark fuscous or reddish brown, with an oblique, white costal streak before the apex, and two others of the same color, but much smaller, on the costa between this and the white base of the wing. Outer part of the wing more or less overlaid with white scales, so dense beyond the cell as to fuse and form a distinct whitish patch.

"There are numerous clusters of metallic scales scattered over the outer part of the wing, some of which form a curved line around the apex on the border, and there are two large clusters of them resting on a black ground between the white patch and the fold. Fringes reddish brown.

"Hind wings and upper side of abdomen fuscous. Under side of all of the wings fuscous, with the white costal spots reproduced, and there are several whitish

cross lines on the under side of the hind wings. Under side of the body white. Legs white, annulate with black."

"Described from four specimens, two from London, Ontario, and two from Massachusetts. This species was figured by the late Townend Glover in his unpublished work on N. A. Lepidoptera, Pl. 83, Fig. 21."

This is a good valid species and distinguished easily from all others, now known, of this genus. Professor Fernald's types are from London, Ont., and Mass. I have one specimen taken near Clarendon, Vermont; one specimen, National Museum. No locality label. Characteristics: (1) Head, palpi, thorax and base of primaries (about one-quarter) white; (2) large black patch near hind angle, primaries crossed vertically by paler line of white and pink scales and a ring or eye like spot of metallic scales with center black, metallic scales distinctly raised.

I would very much appreciate the privilege of examining additional specimens of this genus, and will take pleasure in naming and returning promptly all examples that may be sent for that purpose, and especially would be grateful for notes or information pertaining to the larvæ or early stages.

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## THE LARVA OF EUTHISANOTIA TIMAIS CRAM.

BY HARRISON G. DYAR.

1852.—GUENÉE, Spec. Gen., VI, pl. 2, f. 5.

1857.—CHENU-DEMARETS, Encycl. Hist. Nat. Papill., II, 111.

1886.—GUNDLACH, Ent. Cubana, 304.

1894.—SLOSSON, Journ. N. Y. Ent. Soc., II, 107.

1901.—SWAINSON, Journ. N. Y. Ent. Soc., IX, 81.

1901.—DYAR, Proc. Ent. Soc. Wash., IV, 454 (egg).

Guenée's figure represents a white larva with a straight black band in the segmental incisures and two narrower ones on the central part of each segment. Head and feet blackish. Mrs. Slosson described the larva briefly as "velvety black, marked with creamy white, head and feet of orange red"; Mrs. Swainson as "black, covered with small pale yellow dots; face, legs and tail dull buff with black marks."

Larvæ before me from the Everglades, seven miles from Miami, Florida, through Dr. J. E. Benedict, April 6, 1901, do not agree with Guenée's figure, but rather with the descriptions of the two ladies. I have not seen the other references.